

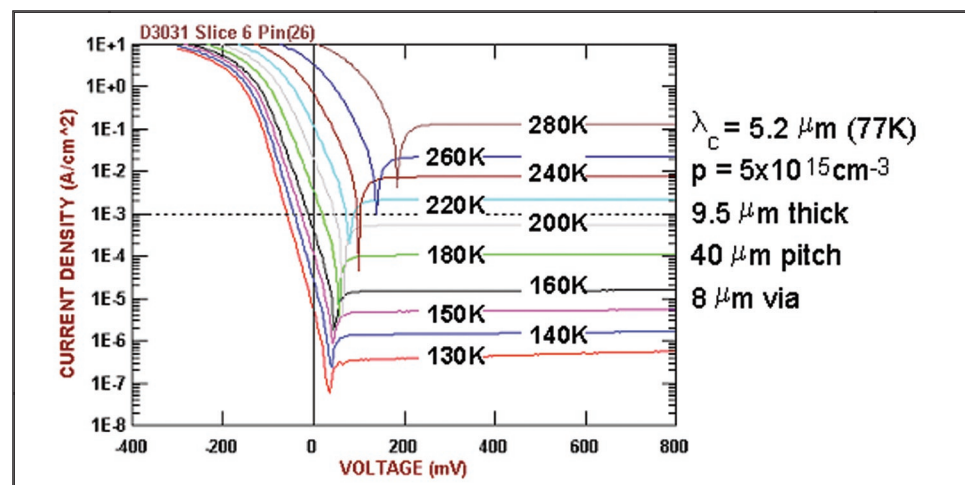


Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

AFRL HOTSTAR



Higher-operating-temperature, staring focal plane arrays (FPAs) is a Category 2b Advanced Technology Demonstration program to develop medium waveband infrared (MWIR) FPAs that meet the stringent requirements of space-based missile warning programs, with cooling at higher operating temperatures provided by passive space radiators.



Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

The Space Vehicles Directorate awarded the HotStar program to DRS Infrared Technologies of Dallas, Texas, as a vehicle for developing higher-operating-temperature MWIR FPAs. DRS Infrared Technologies delivered standard (copper-doped) FPAs under HotStar to the directorate to evaluate in the directorate's characterization facility for level of performance and to establish a technology baseline prior to improving the technology.

As part of the solution to meeting these stringent performance requirements, achieved in the past only with cryogenic (sub-100 Kelvin) operating temperatures, a revision (at DRS Infrared Technologies) in the standard doping process replaces copper with gold atoms to achieve the p-type doping side of the photodiode junctions. The lower dark currents associated with the new doping approach allow HotStar to meet its performance objectives and also benefit Navy programs that have adapted the gold-doping technology for ship-based defense technology.

Background

DRS Infrared Technologies developed the high-density, vertically interconnected photodiode (HDVIP) process for single waveband FPAs in response to the Defense Advanced Research Projects Agency's Infrared Focal Plane Array's Flexible Manufacturing program. The processing begins with tellurium-rich, liquid phase epitaxial growth of p-type detector material diced and epoxied onto cryogenic multiplexers.

DRS Infrared Technologies makes interconnects to the multiplexer pads with the etching of vias, followed by their metallization (with this step representing a substantial deviation from the indium bump interconnection used by most other infrared FPA manufacturers). At the time of the via etching process, DRS Infrared Technologies converts the axial region surrounding the via from p- to n-type, thereby forming the photodiode. Other advantages of the HDVIP process for the HotStar application include compatibility with microlensing approaches to reduce the ratio of photodiode junction to pixel optical areas.

Space Vehicles
Technology Transfer

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-VS-10)